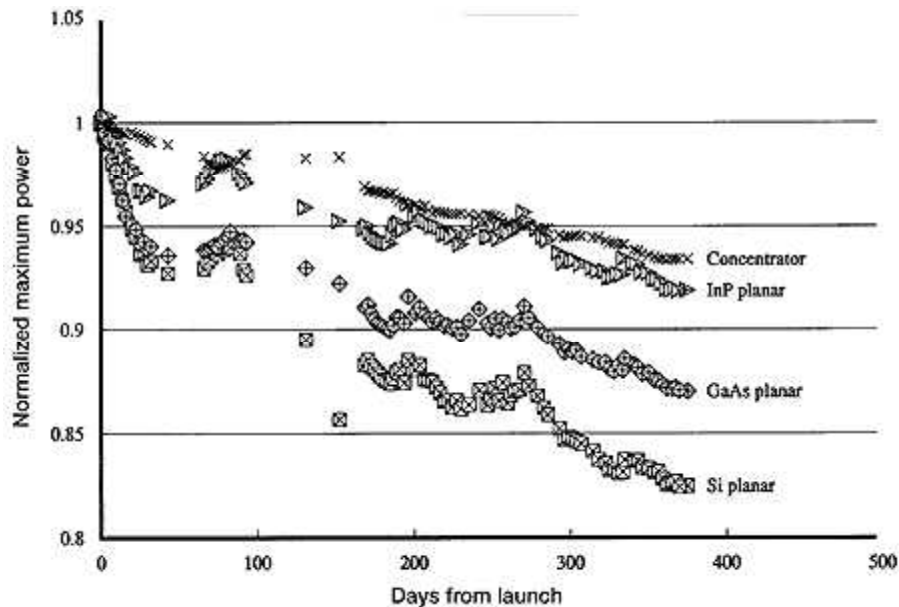


Valuable Data Provided by PASP Plus Flight Experiment After 1 Year in Orbit

Successfully launched on August 3, 1994, the Photovoltaic Array Space Power Plus Diagnostics (PASP Plus) flight experiment is a joint Air Force Phillips Laboratory/NASA Lewis Research Center program designed to test a variety of new and existing photovoltaic (PV) cell and array technologies within the space environment. The experiment consists of 12 different experimental photovoltaic modules, along with numerous diagnostic instruments that measure the space environment and interactions between the experimental modules and that environment. Power Technology Division personnel at Lewis, who had the primary responsibility for integrating the individual photovoltaic module experiments, continue to analyze and interpret the current-voltage characteristics and environmental effects data received back from the spacecraft.

The major goals of the experiment included determining the long-term performance of the photovoltaic modules within a high-radiation environment (PASP Plus was launched into an elliptical, high-radiation orbit) and measuring the interactions between the experimental modules and the space plasma when the modules were biased at high positive and negative voltages. Understanding array interactions within the space plasma is critical to spacecraft power system operations and important to providing higher bus voltage designs in the future.

After 1 year in orbit, a wealth of data has been obtained. Some of the major results show that refractive concentrator arrays provide excellent resistance to space radiation-induced degradation effects. The refractive concentrator optics have shown good survivability within the space environment and the off-pointing performance of this array is consistent with predicted results. Planar cells made from indium phosphide (InP) show less degradation than traditional gallium arsenide (GaAs) and silicon (Si) cells, specifically for this high-radiation, proton-dominated orbit. The light-induced degradation effects of amorphous silicon cell technology have been observed and are consistent with the results predicted by current models. General trends have also been observed for plasma current collection and arcing during the high-voltage biasing experiments. These trends confirm that the cell/array design is critical to the magnitude of the plasma interactions expected for an operational array. The observations noted herein are representative of the invaluable information that PASP Plus has provided to various organizations in NASA, other Government agencies, and industry.



PASP Plus experimental data exhibit performance trends of different cell materials and array types after 1 year in orbit.

Recent anomalies with the experiment and spacecraft electronics, primarily induced by the high-radiation environment, indicate that PASP Plus may have reached the limit of its useful life. Yet, after just 1 year in orbit, PASP Plus has achieved all its initial objectives. The high-voltage plasma-interaction experiments are complete, and by virtue of the higher orbital apogee attained, the desired cumulative radiation dose was achieved. Although analysis continues on the massive amounts of data obtained over the past year, PASP Plus already has shown itself as "one of the premier experiments with regard to long-term solar cell evaluation and testing in space" (Sal Grisaffe, former Director of Lewis' Aerospace Technology Directorate).